SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : DuPont™ Opteon™ yf
Tradename/Synonym : 2,3,3,3-Tetrafluoropropene
HFO-1234yf
R1234yf

MSDS Number : 130000043292

Product Use : Refrigerant, For professional and industrial installation and use only.

Manufacturer : DuPont
1007 Market Street
Wilmington, DE 19898

Product Information : 1-800-441-7515 (outside the U.S. 1-302-774-1000)
Medical Emergency : 1-800-441-3637 (outside the U.S. 1-302-774-1139)
Transport Emergency : CHEMTREC: 1-800-424-9300 (outside the U.S. 1-703-527-3887)

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview
Rapid evaporation of the liquid may cause frostbite. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Potential Health Effects

Skin
2,3,3,3-Tetrafluoropropene : Contact with liquid or refrigerated gas can cause cold burns and frostbite.

Eyes
2,3,3,3-Tetrafluoropropene : Contact with liquid or refrigerated gas can cause cold burns and frostbite.

Inhalation
2,3,3,3-Tetrafluoropropene: Other symptoms potentially related to misuse or inhalation abuse are: Anaesthetic effects, Light-headedness, dizziness, confusion, incoordination, drowsiness, or unconsciousness.

Carcinogenicity
None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, or OSHA, as a carcinogen.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,3,3,3-Tetrafluoropropene</td>
<td>754-12-1</td>
<td>&gt;=99.5%</td>
</tr>
</tbody>
</table>

SECTION 4. FIRST AID MEASURES

Skin contact: Take off all contaminated clothing immediately. Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.

Eye contact: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Inhalation: Remove from exposure, lie down. Move to fresh air. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Consult a physician.

Ingestion: Is not considered a potential route of exposure.

General advice: Never give anything by mouth to an unconscious person. When symptoms persist or in all cases of doubt seek medical advice.

SECTION 5. FIREFIGHTING MEASURES

Flammable Properties
Autoignition temperature : 405 °C (761 °F) at 1,020 hPa  

Lower explosion limit : 6.2 vol% at 21 °C (70 °F)  
Upper explosion limit : 12.3 vol% at 21 °C (70 °F) at 1013 hPa  

Fire and Explosion Hazard : Vapours are heavier than air and may spread along floors. Vapours may form flammable mixture with air. Fire or intense heat may cause violent rupture of packages.  
Hazardous thermal decomposition products: Hydrogen fluoride Fluorinated compounds Carbon oxides  

Suitable extinguishing media : Water spray, Alcohol-resistant foam, Dry chemical, Carbon dioxide (CO2)  

Firefighting Instructions : In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment. Wear neoprene gloves during cleaning up work after a fire.  
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Evacuate personnel to safe areas. Cool containers / tanks with water spray. Fire or intense heat may cause violent rupture of packages.  

SECTION 6. ACCIDENTAL RELEASE MEASURES  
NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.  
Safeguards (Personnel) : Evacuate personnel to safe areas. Ventilate the area. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Refer to protective measures listed in sections 7 and 8.  
Spill Cleanup : Evaporates.  
Accidental Release Measures : Should not be released into the environment. In accordance with local and national regulations.
SECTION 7. HANDLING AND STORAGE

Handling (Personnel) : Avoid breathing vapours or mist. Avoid contact with skin, eyes and clothing. Provide sufficient air exchange and/or exhaust in work rooms. For personal protection see section 8. Handle in accordance with good industrial hygiene and safety practice.

Handling (Physical Aspects) : Vapours are heavier than air and may spread along floors. Vapours may form flammable mixture with air. The product should only be used in areas from which all naked lights and other sources of ignition have been excluded. Electrical equipment should be protected to the appropriate standard. May be ignited by open flame. Take measures to prevent the build up of electrostatic charge. Keep away from heat and sources of ignition. When using do not smoke.

Storage : Do not drag, slide or roll cylinders. Never attempt to lift cylinder by its cap. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Keep containers tightly closed in a cool, well-ventilated place. Store in original container. Protect from contamination.

Storage temperature : < 52 °C (< 126 °F)

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls : Ensure adequate ventilation, especially in confined areas. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Personal protective equipment

Respiratory protection : For rescue and maintenance work in storage tanks use self-contained breathing apparatus. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Hand protection : Material: Heat insulating gloves Additional protection: Protective gloves complying with EN 374., or, US OSHA guidelines

Eye protection : Wear safety glasses or coverall chemical splash goggles. Eye protection complying with EN 166. or ANSI Z87.1 Additionally wear a face shield where the possibility exists for face contact due to splashing, spraying or airborne
Material Safety Data Sheet

**DuPont™ Opteon™ yf**

Version 2.1

Revision Date 07/15/2011 Ref. 130000043292

Contact with this material.

**Skin and body protection** : Wear suitable protective equipment.

**Protective measures** : When using do not smoke.

**Exposure Guidelines**

**Exposure Limit Values**

None established.

**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Liquefied gas</td>
</tr>
<tr>
<td>Color</td>
<td>Colourless</td>
</tr>
<tr>
<td>Odor</td>
<td>Slight, ether-like</td>
</tr>
<tr>
<td>pH</td>
<td>Neutral</td>
</tr>
<tr>
<td>Melting point</td>
<td>-152.2 °C (-242.0 °F)</td>
</tr>
<tr>
<td>Boiling point</td>
<td>-29.4 °C (-20.9 °F)</td>
</tr>
<tr>
<td>Vapour Pressure</td>
<td>5,830 hPa at 20 °C (68 °F)</td>
</tr>
<tr>
<td>Water solubility</td>
<td>0.1982 g/l at 24 °C (75 °F)</td>
</tr>
<tr>
<td>Partition coefficient: n-octanol/water</td>
<td>log Pow: 2 at 25 °C (77 °F) (calculated)</td>
</tr>
<tr>
<td>Vapour density</td>
<td>4 (Air = 1.0)</td>
</tr>
</tbody>
</table>

**SECTION 10. STABILITY AND REACTIVITY**

**Conditions to avoid** : Heat, flames and sparks. Do not spray on a naked flame or any incandescent material.

**Incompatibility** : Strong bases, Alkaline earth metals, finely divided metal powders, such as, Aluminium, Magnesium, Zinc, or, strong oxidizers

**Hazardous decomposition products** : Hazardous thermal decomposition products may include: Hydrogen fluoride, Fluorinated compounds, Carbon oxides

**Hazardous reactions** : Hazardous polymerisation does not occur.
Vapours may form flammable mixture with air.

### SECTION 11. TOXICOLOGICAL INFORMATION

**DuPont™ Opteon™ yf**

**Further information:**
- Rapid evaporation of the liquid may cause frostbite.

**2,3,3,3-Tetrafluoropropene**
- **Dermal**: not applicable
- **Oral**: not applicable
- **Inhalation 4 h LC50**: > 405000 ppm, rat

**Inhalation**
- dog
- Not a cardiac sensitizer.

**Skin irritation**
- No skin irritation, Not tested on animals
- Not expected to cause skin irritation based on expert review of the properties of the substance.

**Eye irritation**
- No eye irritation, Not tested on animals
- Not expected to cause eye irritation based on expert review of the properties of the substance.

**Skin sensitization**
- Not tested on animals
- Not expected to cause sensitization based on expert review of the properties of the substance.
- There are no reports of human respiratory sensitization.

**Repeated dose toxicity**
- Inhalation
  - rat
  - No toxicologically significant effects were found.

**Mutagenicity**
- Did not cause genetic damage in animals.
- Did not cause genetic damage in cultured mammalian cells.
- Experiments showed mutagenic effects in cultured bacterial cells.

**Reproductive toxicity**
- Animal testing showed no reproductive toxicity.

**Teratogenicity**
- Animal testing showed effects on embryo-fetal development at levels
equal to or above those causing maternal toxicity.

SECTION 12. ECOLOGICAL INFORMATION

Aquatic Toxicity
2,3,3,3-Tetrafluoropropene

96 h LC50 : Cyprinus carpio (Carp) > 197 mg/l

72 h NOEC : Algae > 100 mg/l

48 h EC50 : Daphnia magna (Water flea) > 100 mg/l

Environmental Fate
DuPont™ Opteon™ yf
Biodegradability : According to the results of tests of biodegradability this product is not readily biodegradable.

SECTION 13. DISPOSAL CONSIDERATIONS

Waste Disposal : Can be used after re-conditioning. In accordance with local and national regulations.

Environmental Hazards : Empty pressure vessels should be returned to the supplier.

SECTION 14. TRANSPORT INFORMATION

DOT UN number : 3161

Proper shipping name : Liquefied gas, flammable, n.o.s. (2,3,3,3-Tetrafluoropropene)

Class : 2.1
Labelling No. : 2.1

IATA_C UN number : 3161

Proper shipping name : Liquefied gas, flammable, n.o.s. (2,3,3,3-Tetrafluoropropene)

Class : 2.1
SECTION 15. REGULATORY INFORMATION

**TSCA Status**: Listed.

This material contains one or more substances which are subject to a TSCA Section 5 Consent Order or Significant New Use Rule (SNUR). This material contains one or more substances which requires export notification under TSCA Section 12(b) and 40 CFR Part 707 Subpart D:

- 1-Propene, 2,3,3,3-tetrafluoro- (CAS No. 754–12–1)

**PMN Number**: P-07-601

The approved uses are: refrigerant in motor vehicle air conditioning systems.

Processors and users of this substance must also comply with the applicable general SNUR requirements set forth in 40 CFR 721 subpart A, including export notification requirements if applicable (40 CFR 721.20), and the applicable record keeping requirements set forth at 40 CFR 721.125.

Importers are subject to the TSCA section 13 (15 U.S.C. 2612) import certification requirements set for at 19 CFR 127.28.

Contact your local DuPont sales or technical representative for more information.

**SARA 313 Regulated Chemical(s)**: SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**California Prop. 65**: Chemicals known to the State of California to cause cancer, birth defects or
any other harm: none known

SECTION 16. OTHER INFORMATION

Opteon™ is a trademark of E. I. du Pont de Nemours and Company
Before use read DuPont's safety information.
For further information contact the local DuPont office or DuPont's nominated distributors.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Significant change from previous version is denoted with a double bar.